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application:

P103232WO

Application No. 2003/0219

Date of Filing 25 March 2003

Applicant MILTON THOMPSON, of British nationality, of 7
Hill Street, Wexford Town, County Wexford,
Ireland

Dated this 5th day of July 2004.

Eide Murphy

An officer authorised by the
Controller of Patents, Designs and Trademarks.

REQUEST FOR THE GRANT OF A PATENT

PATENTS ACT, 1992

2003/0219

The Applicant(s) named herein hereby requests



the grant of a patent under Part II of the Act.



the grant of a short-term patent under Part III of the Act

on the basis of the information furnished hereunder.

1. Applicant(s)Name Milton ThompsonAddress 7 HILL ST, WEXFORD TOWN,
CO. WEXFORD, IRELANDDescription/Nationality

BRITISH

2. Title of Invention

Security authorisation system (and method).

3. Declaration of Priority on basis of previously filed application(s) for same invention (Sections 25 & 26)Previous filing dateCountry in or for
which filedFiling No.4. Identification of Inventor(s)Name(s) of person(s) believed by Applicant(s) to be the inventor(s) Milton ThompsonAddress 7 HILL ST, WEXFORD TOWN, CO. WEXFORD
IRELAND

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FAIGHTE

25 MAR 2003

5. Statement of right to be granted a patent (Section 17(2)(b))

6. Items accompanying this Request – tick as appropriate

- (i) ☒ Prescribed filing fee (€ 125)
- (ii) ☒ Specification containing a description and claims
- ☒ Specification containing a description only *claims to follow*
- ☒ Drawings referred to in descriptions or claims
- (iii) ☐ An abstract
- (iv) ☐ Copy of previous application(s) whose priority is claimed
- (v) ☐ Translation of previous application whose priority is claimed
- (vi) ☐ Authorisation of agent (this may be given at 8 below if this Request is signed by the Applicant(s))

7. Divisional Application(s)

The following information is applicable to the present application which is made under Section 24 –

Earlier Application No:

Filing Date:

8. Agent

The following is authorised to act as agent in all proceedings connected with the obtaining of a patent to which this request relates and in relation to any patent granted –

Name

Address

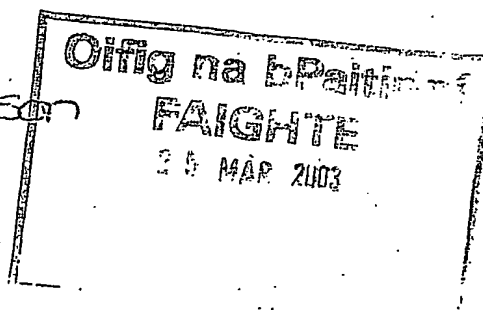
9. Address for Service (if different from that at 8)

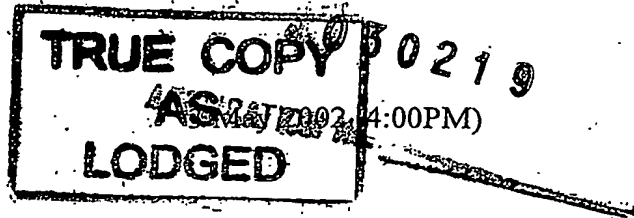
Signed Name(s): *Milton Thompson*

Capacity (if applicant is a body corporate):

M. Thompson

Date



Security authorisation system [and Method]

This invention relates to security systems and particularly to confining correct operation of functional apparatus to the presence of an authorised user [and more particularly to disabling functioning apparatus separated from the authorised user] .

The invention is concerned with apparatus which functions under the direct control of an operator as, or on behalf of, an authorised user [in possession of the apparatus or apparatus-controlling devices that equate to possession of the apparatus. For convenience, at least in] and in this respect, as least for convenience in discussion of the background to the invention, a suitably authorised operator and an authorised user are considered synonymous, although they need not be.

The invention is concerned particularly, but not exclusively, with functional apparatus which is moveable insofar as the apparatus or a constituent thereof can be removed to a place unknown to the authorised user. It concerns apparatus which is physically in the possession of the authorised user, carried thereby (such as a cellular telephone or a computing device) or vice versa (such as a motor vehicle), and apparatus function-controlling devices, conveniently herein called "key devices", which themselves may constitute functional apparatus with a limited degree of functionality required to initiate operation of apparatus, and which apparatus or devices may nevertheless be snatched from the authorised user as a criminal act predicated upon the element of surprise and/or menace, where the speed by which the authorised user, or victim, is deprived thereof renders the criminal less likely to be identifiable and/or the victim less likely to resist and increase the seriousness of the crime with personal violence.

The invention is particularly concerned with moveable apparatus in the form of a motor vehicle in which a driver forms the operator, and which because of its value and/or utility to a criminal is an attractive target. Although many vehicles have sophisticated entry- and function-authorising systems which deny entry to, and/or initiating functioning of, the vehicle to any potential operator without the correct key devices, and patent specification number GB-A-2342742 exemplifies the level of the measures proposed to prevent circumventing use of the correct key devices, the situation still exists whereby the person in possession of these key devices is de facto the authorised user.

Because of such sophistication, it has become commonplace for vehicle thieves to avoid attempting to by-pass entry-denial and ignition-denial systems, instead stealing genuine key devices from the premises of the genuine holder using standard burglary or sneak-thief techniques that avoid contact with the holder, or by robbery, snatching the key devices from the person of the genuine holder within such premises or as the holder transits between the premises and the vehicle.

[It is also known to replace or supplement such physically held key devices by some form of personal code which the authorised operative enters into vehicles by a key pad or the like which ostensibly mitigates any benefit to a criminal simply taking possession of the key devices, but it is believed by some that such a feature may in practise put both the possessor of the code and robber in increased personal danger by confrontation to effect forced divulgence.]

However, having regard to [the above mentioned personal authorisation code being required to enter the vehicle and/or start the vehicle engine and] the fact that many operators now transit between vehicles and premises in places not readily accessible to criminals, unattended

theft is becoming more unattractive and it is becoming more prevalent for criminals to snatch a fully-functioning vehicle when it is brought to a halt by a traffic sign, signal or obstruction and forcing a surprised and disorientated driver to leave the functioning vehicle which is ready to be driven away. Such crime is frequently referred to as "hijacking" or "carjacking", and the terms are used herein in this context.

Proposals have been made to address the problem of unauthorised driving way of a vehicle as a result of unattended theft or hijacking. WO 01/32479 describes a system including a cellular phone arrangement whereby in addition to notifying the authorised operator that an unattended alarm condition has been recognised, it also permits the authorised operative, if in possession of a phone, to disable the vehicle remotely; such a system would apparently permit the victim of a hijacking also to remotely disable the taken vehicle. In a similar manner, US 6,206,130 describes a hand-held security system transmitting device by which the authorised operator may actively enable or disable functioning of the vehicle remotely, although it must be operated whilst the vehicle is in the vicinity. However, in both of the above, a positive action is required in the part of the authorised operator and in the circumstances of a hijacking this may not occur to a disorientated victim until it is too late to take appropriate action. Furthermore, it is likely that a hijacker would force a victim to hand over a phone device or other apparent vehicle-specific device to delay reporting of the incident to the authorities.

US 5,494,130 also addresses the problem of vehicle hijacking by having built into the vehicle a driver's seat switch to detect the driver leaving the seat of a functioning vehicle and therefrom initiating a delayed immobilisation of the vehicle such that an unsuspecting hijacker creates a separation in space and time from the victim/authorised operator before the vehicle is fully immobilised. However, insofar as such system may be known by a potential hijacker

to exist in a particular model of vehicle or be ascertained by inspection, such potential hijacker may learn to effect driver transfer without disturbing the switch and/or put the authorised driver at risk of greater harm by abducting him and forcing him to drive to a place where such transfer can be affected or the authorised driver forced to part with the details for cancelling immobilisation.

As indicated above, such hijacking or vehicle snatching is one example of separating an authorised user of functioning apparatus from the apparatus and in order to benefit from its functioning it is an object of the present invention to provide an authorisation system for [and method of] preventing function of apparatus removed from the presence of an authorised user that is versatile and readily implemented and less compromising to the user's safety than systems [and methods] known hitherto.

According to [a first aspect of] the present invention an authorisation system, for permitting apparatus functional under the control of an operator to function normally only in the presence (as herein defined) of an authorised user, comprises complementary parts of wireless communication means arranged to be carried in operation by the apparatus and a [said] authorised user of the apparatus and operable to effect, within a spatial envelope defining a predetermined permissible working relationship between the authorised user and the apparatus, a communication link defined by continual transfer [with reference to a temporal envelope] of identifying information pairing the authorised user and the apparatus, said communication means being responsive to existence of said link to effect authorisation of the apparatus permitting it to function normally under said operator control and to cessation of an existing link to functioning apparatus to inhibit normal functioning of the apparatus after a [predetermined] time delay [of such duration as to?].

Preferably the communication means is operable in the radio frequency band. Preferably the communication means comprises user transmission means carried by the user part and apparatus reception means carried by the apparatus part, having therein means to produce an identity reference unique to the pair, the UTM being operable to transmit radiation modulated in accordance with said identity reference and the ARM being responsive to receipt of said modulated radiation to confirm by transfer of identifying information including said identity reference existence of a communication link between them.

The communication means may further comprise apparatus transmission means in the apparatus part and user reception means in the user part arranged to effect bi-directional communications between the apparatus part and the user part. Then, the user and apparatus parts may each have therein means to produce a further identity reference unique to the pair, the ATM being operable to transmit radiation modulated in accordance with said further identity reference and the URM being responsive to receipt of said modulated radiation to confirm existence of a communication link between them.

In any event the URM may be responsive to receipt of a transmission from the ATM to enable transmission from the ATM. Furthermore, at least the UTM of the user part may derive operating power from the radiation received from the ATM.

The identity reference, and if appropriate the further identity reference, may be based upon generation of at least one random or pseudo-random number.

Preferably said modulation of the transmitted radiation is in accordance with a digital code. Where this is so, said modulation may be in accordance with a rolling digital code changed for each transmission.

Alternatively or additionally, the communication means may be arranged to change at least the carrier frequency of the modulated radiation in accordance with a digital code during communication. Where this is radio frequency, the communication means is arranged to effect a communication link in accordance with the Bluetooth wireless specification or comparable wireless peer-to-peer networking specification.

The temporal envelope may comprise at each of sequential time intervals a time window of predetermined duration, and the apparatus part responsive to receipt of identifying information from the user part within each time window to provide authorisation of the apparatus until the next window and responsive to absence of identifying information to determine cessation of the communication link.

The apparatus part may be responsive to the absence of receipt of identifying information within a predetermined number of consecutive time windows to determine cessation of the communication link. The sequential time intervals are contiguous or spaced apart. Irrespective of the relationship between time intervals, the time window associated with each time interval may have a duration extending between successive time intervals.

An authorisation system according to the present invention as defined in the preceding paragraphs may advantageously be adapted for use with moveable apparatus susceptible to being taken from the possession of the authorised user whilst functioning, and wherein the time delay is chosen having regard to the movability of the apparatus to permit a taker of the apparatus to become separated from the authorised user by a distance sufficient to ensure the safety of the authorised user. Preferably, the time delay is greater than 30 seconds and may be in the range 30 seconds to 5 minutes.

An authorisation system according to the present invention is particularly suited to permitting use of apparatus comprising a vehicle having an occupants cab and an engine and whereby normal function thereof is by an operator who is an occupant and driver; the authorisation system then has the spatial envelope defined to encompass, and preferably be substantially co-extensive with, the occupants cab and the apparatus part is arranged to form a communication link with a user part carried by an occupant of the cab and to be operably coupled to the vehicle to authorise or inhibit functioning of the vehicle engine by the driver, that is, bring the vehicle to rest and inhibit it from further movement.

Insofar as such a vehicle has its engine supplied with fuel by way of a fuel delivery system, the apparatus part of the system may be arranged to be operably coupled to the vehicle to authorise or inhibit delivery of fuel to the engine. Additionally or alternatively, it may be operable to effect said inhibition of normal functioning after a said time delay by progressively reducing the delivery of fuel to the engine during said time delay.

Insofar as an authorisation system according to the invention is not limited to specific apparatus, and sudden failure of the apparatus may arouse suspicion, the apparatus part may be operable in the time delay to effect temporary or permanent inhibition of multiple functional aspects of the apparatus to disguise responsibility of any particular functional aspect for non-functioning of the apparatus.

Furthermore, if the authorisation system is employed for apparatus having a telephone communication ability, the apparatus part may be operable during said time delay to effect a telephone call to a predetermined recipient.

When the authorisation system is adapted for use with apparatus such as the aforementioned vehicle in which operation of the apparatus is initiated by the operator prior to effecting control of functioning thereof, the apparatus part may be responsive to initiation of operation of the apparatus by the operator to initiate establishment of the communication link prior to, or contemporaneously with, functioning of the apparatus.

The apparatus part of the authorisation system may be arranged to be carried by the apparatus in functioning but removable when it is not intended to function and in such circumstances may include apparatus operation initiation means operable to permit initial operation of the apparatus.

An authorisation system according to the invention may have the communication means include a relay part arranged to be disposed, in respect of the communication link, between the user part and apparatus part and wherein at least the user part is arranged to transfer identifying information by way of [establish a communication link with] the relay part in preference to establishing a communication link with the apparatus part directly. The communication means may be arranged to attempt to establish a communication link including the relay part and in absence thereof to establish a communication link directly between the user part and the apparatus part.

The relay part is arranged to be carried by the user in operation, and it may include, or be included in, additional functional apparatus under the control of the authorised user and the relay part is arranged to effect in response to cessation of an existing communication link with the user part of the communication means during functioning of the additional apparatus inhibition of normal functioning after a time delay.

Embodiments of the invention will now be described with reference to the accompanying drawings, in which:

Figure 1(a) is

Figure 2 is

Figures 3(a) and 3(b)

Figure 4

Figure 5

Referring to Figure 1 (a) a vehicle 10 comprises apparatus which functions normally, that is, in respect of performing those functions normally required of it, under the control of an operator 12 who is more conventionally called the driver. The vehicle is moveable and includes a cab 14 which typically has seats for a plurality of occupants 12, including the driver. Whereas for normal functions the vehicle is under the direct control of the driver, the functioning of the vehicle may be authorised by any user of the vehicle occupying of the cab, that is, the driver or another occupant sub-authorising the driver.

The vehicle is not described in any more detail than is necessary to explain the invention and typically includes an engine shown at 16 which is controlled by the driver in respect of initiating its operation and changing performance functions, optionally in conjunction with an electronic engine management unit (EMU) 20.

The engine 16 is powered by liquid fuel delivered to the engine from a storage tank 22 by way of a fuel delivery system including electrically operated supply pump 23 and fuel distribution and input means 24, which may comprise a carburettor (as shown ghosted at 24₁), that includes a small storage chamber for fuel, or, more conventionally in modern gasoline engines,

and in compression ignition (diesel) engines a plurality of fuel injection pumps and valves 24₂.

Other features of the vehicle, as they relate to its operation are shown by the enlargement of the circled region, in Figure 1(b).

To complete the overview of the vehicle as apparatus under the direct control of an operator-driver, such operator effects operation by initiating functioning of both the vehicle chassis and of the engine by which the vehicle moves. Initiation of operation usually is effected by the driver, as authorised operator, inserting a key device 26₁ into a co-operable lock 26₂ which releases a steering lock (not shown) and authorises the EMU 20 to enable the engine to be started and the supply pump 23 to deliver fuel for the engine. The key device 26₁ may take the form of a physical key 27₁ and optionally carry in the key radio frequency transducing means 27₂, paired with a lock 28₁ (and optional transceiver 28₂) fitted to the vehicle. In the manner disclosed inter alia in GB-A-2342742 the transceiving means is arranged to program the key in use, issuing it with a code to be transmitted upon next usage so that only if the codes agree does the key function to initiate operation of the engine, and for practical purposes making it virtually impossible to start the engine without permission of the genuine or authorised key.

An alternative key device, as shown ghosted at 29₁, employs a key-card of flexible plastics material and carrying thereon means in the form of a magnetic strip or a semi-conductor integrated circuit including a processor and memory and often known to as a smart-card, which is able to co-operate with a reader 29₂ fitted to the vehicle. Such a card-key is able to store a larger number of parameters vital to initiating operation of the engine, and may also be re-programmed from usage-to-usage, but nevertheless serves as a key device to effect initiation of vehicle engine operation by virtue of being in the possession of the user at start-up and in position in the vehicle thereafter.

As outlined above, such in-situ programming of the primary engine initiating device (key, key-card) is intended to make it difficult for an unauthorised user to tamper with the vehicle, particularly the EMU in order to start the engine and steal the vehicle, or as additional anti-theft devices which respond to an attempt at unauthorised entry into the vehicle cab or engine bay or even disturbance of the vehicle itself to trigger an alarm.

[XXXoutXXFurthermore as also described in the aforementioned GB-A-2342742 it is also known to prevent attempts by-passing the security function of the EMU in such a way that the fuel supply pump can be operated in conjunction with limited ignition function to run the engine for the purpose of unauthorised taking of the vehicle.]

Known arrangements for ensuring that the vehicle, through its engine, functions normally only for the driver in possession of the appropriate key device, and as discussed above the effect is to treat the possessor of the key device as the authorised user and it leads to the situation where a criminal is tempted to steal the appropriate key device for the vehicle and further tempted to ensure the key device is correctly authorised by separating the key device from the owner at a time when the owner is in the vicinity of the vehicle, or has it fully functioning in the process of being driven; that is, hijacking.

In accordance with the present invention there is introduced an authorisation system, indicated generally at 30, with the intention of permitting functioning of the vehicle normally under driver control only in the actual presence of an authorised user, rather than merely the presence of the normal key devices which hitherto has constituted de-facto authorisation. In this embodiment an authorised user may be any occupant 12 of the vehicle cab, conveniently, but not necessarily, the driver 12, and presence is that defined by presence within [or immediately adjacent] the vehicle cab.

In general terms, the authorisation system comprises wireless communication means 32 having complementary parts 34 and 36 arranged to be carried in operation by the apparatus (the vehicle) and a said authorised user of the apparatus (here shown as driver 12) respectively. The parts may communicate by any suitable contactless system, such as optically or ultrasonically, but preferably operate at radio frequencies and preferably at those in the GHz or microwave bands.

The parts of the communication means, conveniently referred to as the "apparatus" or "apparatus-carried" part 34, and "user" or "user-carried" part 36, are arranged to effect, within the spatial envelope of the cab that defines a permissible working relationship between the authorised user and apparatus (vehicle), a communication link defined by continual transfer of identifying information pairing the authorised user and the apparatus. The identifying information is described further below as is the nature of continual transfer, being with respect to a temporal envelope which supplements the spatial envelope defining permissible separation of the parts.

The communication means 32 is responsive to the existence of said link that confirms the "presence" of the authorised user to effect authorisation of the vehicle, permitting it to function normally under control of a driver-operator in possession of the appropriate key device, but to deny authorisation when not present, preventing a driver who is not the authorised user from using the key device obtaining or maintaining functioning of the engine of the vehicle.

Initiation of operation of the vehicle may be effected separately from, or contingent upon, such communication link, but most importantly, the communication means is responsive to cessation of an existing communication link with previously authorised and functioning apparatus to inhibit the normal functioning of the apparatus after a time delay of such duration, in excess

of 0.5 minutes and may be up to 5 minutes, as to characterise the authorised user and vehicle as having moved apart.

This embodiment is particularly concerned with, and adapted for, an above-discussed hijack situation wherein the fully functioning vehicle, containing the authorised user and driver, is halted and the occupant or occupants forced to leave, and possibly compounded by the hijacker then removing from the erstwhile occupants any cellular telephone or comparable communication devices by which the authorities may be alerted before driving away in the otherwise functioning vehicle.

To this end, the user part 36 of the communication means 32 is arranged to be worn inconspicuously or secreted about the person of the authorised user, and notwithstanding the requirement for such part to effect a radio communication link with the apparatus part, this is feasible having regard to the relatively small spatial envelope in which a communication link has to be established with the apparatus part.

The apparatus part 34 may be permanently fixed with respect to the vehicle to control its engine operation or fixed with respect to, or form part of, an operating key device, such as key 27₁ or key card 29₁, which is, in operation, carried by the vehicle and without which device it will not function.

In normal use of the vehicle, that is, absent any hijacking situation, the authorised user, carrying the user part of the communication means, upon entering the spatial envelope defined substantially by the vehicle cab creates the circumstances whereby the communication means may form a communication link between the user-part and apparatus part, which link is considered maintained by the continual transfer of identifying information pairing the authorised

user and vehicle to the apparatus part. The communication means may exist because of permanent or prior empowerment of the relevant part or parts, or may result from empowerment arising from the driver using the appropriate key device to initiate functioning of the engine. Notwithstanding various options discussed below, by combination of a function-authorising wireless communication link and key device - enabled operation of the vehicle engine, the vehicle is set to function normally without any additional overt actions necessary on the part of the authorised user, other than his presence.

Thus, in such a hijack situation, and depending upon how precisely the spatial envelope of the communication link between the user part and the apparatus part is defined, upon the authorised user leaving the vehicle cab and the vicinity of the vehicle (distancing himself therefrom or having the vehicle drive away) there is a cessation of the authorisation communication link to the functioning vehicle.

The apparatus part 34 of the communication means is functionally connected to the vehicle, to cause the vehicle to stop functioning after a time delay of such duration as to permit the hijacker to become separated from the authorised user. The time delay not only permits the hijacker to move the vehicle from the hijack scene for a distance that is intended to be too great to justify returning to confront the authorised user but also an opportunity for the authorised user to leave the hijack scene. The vehicle is stopped from functioning at the appropriate time either by preventing delivery of fuel to the engine by the fuel pump, stopping the engine suddenly, or by modifying operation of the pump, EMU or other electrical functions to degrade functionality more gradually over at least part of the time delay period. The engine may also be caused to stop functioning by effecting temporary, intermittent inhibition of multiple functional aspects of the vehicle to disguise from the hijacker responsibility of any particular functional aspect for non-functioning of the vehicle.

On the assumption that the authorised user will be re-united with a non-functioning vehicle abandoned by a hijacker, the communication means may be arranged to respond to a resumed presence of the user part to re-establish the communication link that returns full functionality to the vehicle; but preferably the apparatus part is arranged to lock the inhibition of vehicle functionality at least until some positive action is taken to remove the inhibition. A vehicle would have its functionality locked out on a temporary basis, to be overcome by locally or remotely controlled re-setting switch means, but other apparatus, depending largely upon the structural form of the apparatus part, may have its functionality locked on a temporary or permanent basis.

For instance, if the apparatus part is of the removable key-card type, locking out of vehicle functionality may comprise permanently destroying information or functioning of the card. A programmable key device that locks-out upon cessation of the communication link may be re-programmed to overcome temporary loss of functionality.

The apparatus part of the communication means may also include authorised disablement means to override the authorisation system when the vehicle is in the care of trusted non-authorised users, conveniently associated with such re-setting means or as a replacement "master key" device.

It will be appreciated from above that there are a number of ways in which the communication link may be established and its cessation determined.

Referring now to Figure 2 which shows in schematic, block diagram form a first embodiment of communication means at 32, the comprises apparatus and user parts 34, and 36,

respectively and control means 38, coupled to the engine functioning components 20 and/or 23)

The user part 36, includes user transmission means 40, which is operable to emit radio frequency radiation at low power in any suitable band, a power supply unit (PSU) 44, comprising a self-contained primary or secondary battery and, if necessary, a manually operated power switch 45, to prevent drainage of the battery when the transmission means is not in use, and user processing means 46 including timing and storage means 47 to produce an identity reference unique to the user part and apparatus part pair for transmission and effect transmission of radiation modulated in accordance with the identity reference. The term "modulation" as used herein is intended to include any common form of effecting variation of a radio frequency emission and is intent to include modulation in amplitude or frequency or emission per se in accordance with a digital code.

In the presently described embodiment the user processing means 46 is arranged to effect transmissions at intervals, each transmission having a duration short relative to the interval.

The apparatus part 34, comprises ARM 50 which is operable to receive also demodulate or decode the emissions from the UTM, power supply unit 54, which is a secondary battery arranged to be charged by connection to the vehicle supply but operable independently thereof, and apparatus processing means 54 (having timing and storage means 57) arranged to synchronise the ARM with respect to receiving the transmissions from the UTM and for recognising the identity reference from the appropriate modulation form.

In the presently described embodiment the modulating form is a digital code produced by the user processing means and retrieved by the apparatus processing means. The apparatus

processing means stores a corresponding code or the means for generating such code whereby a comparison is able to confirm or otherwise the transfer of identifying information including said identity reference, and by such transfer the existence of a communication link between them.

Existence of such communication link is notified to the control means 38, which in turn authorises functioning of the vehicle by removing a default inhibition of the EMU and/or fuel supply pump 23 that prevents vehicle function by way of the normal driver key device.

The transmitting power or directionality of the UTM and/or the receiving sensitivity or directionality of the ARM combine to define the spatial envelope upon which a successful communication link is based.

As discussed above, it is continuity of an established communication link that is of importance to authorise functioning of the vehicle and cessation of the established link to remove authorisation in a time delayed manner, and to this end the continued existence of the link is defined not only by the dispositions of the user UTM and ARM relative to the spatial envelope but also by transmission and reception with respect to a temporal envelope whereby transmissions are considered to be continually made and received so as to satisfy the criterion of existence of a communication link that sustains authorisation, even if intermittent and discontinuous.

Making reference to Figure 3(a), such temporal envelope comprises in each of a plurality of sequential time intervals $TI_1, TI_2 \dots TIN$, .. a time window $TW_1, TW_2 \dots TW_N$, ... of predetermined duration. Both user processing means 461 and apparatus processing means 561 define the time intervals and the user processing means effects transmission for or within

a time window in each interval. The apparatus processing means then determines if in each time interval a suitably modulated transmission is received. If desired, the apparatus processing means may be further restricted to acknowledge receipt of a transmission only if it occurs within a time window pre-defined as occurring within a part of the window.

Although it is possible hypothetically to pre-define matching time intervals and windows within the user and apparatus processing means, in practice it is difficult to keep them synchronised if they operate completely independently, and each received (and confirmed) transmission may be used to synchronise the apparatus processing means with respect to the user processing means and/or the transmitted identity reference may contain data defining the relative time to, and duration of, the next transmission.

The time intervals may be contiguous as shown in Figure 3(b) and, if desired, the time windows in each may extend from the full interval, as shown for time window TWN, creating a continuous transmission-reception situation, although such a scheme may be perceived to be wasteful of user part power reserves.

It will be appreciated that the above described communication means 321, with its apparatus and user parts 34₁ and 36₁, has simplicity in having a single transmitter and receiver, but also some limitation, such as the need to determine in advance what the UTM is to transmit and when and for the ARM to be set in advance, or adapt to received transmissions, to pair therewith. Also, insofar as it is intended for the user part 36₁ to be carried unobtrusively by the authorised user, the self-contained power supply 441 is necessarily of limited capacity and notwithstanding only intermitted transmissions may require the user to effect manual switching of the part for use.

Such restrictions may be overcome wholly or in part by effecting the communication link by way of bi-directional communication between the apparatus part and the user part.

It will be seen that the parts 342 and 362 are in many respects the same as the parts 341 and 361 and the commonly used elements will be referred to with corresponding reference numbers (other than the suffixes) and not described again unless differing in some respect. Referring now to Figure 4, this shows for a second embodiment of authorisation system communication means 322 comprising apparatus part 342 and user part 362. The apparatus part 36₁ includes in association with the apparatus processing means 562 apparatus transmission means 602 and the user part 34₁ includes in association with the user processing means 462 user reception means 702.

The communications between the parts from the apparatus part to the user part may permit several enhancements in terms of the identification information pairing them, the temporal envelope and, importantly, notwithstanding the additional components, minimising the power usage and requirements of the user part.

Transmissions from the apparatus part to the user part may contain the aforementioned identity reference, so that the user processing means only responds thereto, but preferably contains a further identity reference which is decoded by the user processing means 462 such that the UTM in turn transmits its next signal modulated in accordance with them both. thus both the user processing means and the apparatus processing means have access to two identity references. In this way the identity references may be made to change consistently, as a rolling code, and notwithstanding the need for frequent transmissions to sustain the communication link.

The transmission of signals from the apparatus part to the user part also permits the latter to be arranged only to transmit when in receipt of a suitable signal from the ATM. Thus the apparatus processing means may define the aforementioned time intervals and time windows in accordance with some pre-programmed and/or randomised regime whereby the transmission of signals from the UTM is always synchronised to a reception window.

Furthermore, the radio frequency energy of apparatus part transmissions may be employed by the user part 362 to provide or supplement the operating power of its supply 442; that is, the URM may include rectification means 722 for a part of the signal and charge a secondary battery source or, in some instances, a capacitor (not shown) that replaces such primary or secondary battery source. Depending upon the storage capacity of the power supply 442, the receipt or lack of receipt of signals from the ATM may comprise direct control over the user parts ability to effect a response transmission. Alternatively, the user processing means 462 may put the user part into a low consumption "sleep" mode until awoken by receipt of a suitably verified transmission from the apparatus part

Conveniently, the identity reference modulation applied to transmissions from each of the ATM and UTM comprises a digital code which is based upon one or more random or pseudo-random numbers generated within either or both of the apparatus part or user part and/or encrypted and decrypted in accordance with algorithms stored in said parts; for example, in a manner similar to that described in the aforementioned GB-A-2342742 but here applied to the radio frequency transmissions between the parts and repeated continually as defined by the temporal envelope. Thus within each time window, the apparatus part expects to receive a signal which contains an identifying reference unique to the pair, and preferably one unique to the transmission, insofar as it is based upon a number randomly or pseudo-randomly

generated by the apparatus part transmitted to and modified by the user processing means for its identity reference from which the original number that can be extracted for confirmation.

Instead of, or in addition to, elaborate and encrypted codes to effect the pair identifying information, the transmission and reception parts may also be arranged during each transmission to undergo carrier frequency hopping to further lessen the chance of incorrect pairing or loss of communication link in accordance with the Bluetooth standard or a comparable radio frequency peer-to-peer networking standard. [descr]

As discussed, the apparatus part expects receipt of an appropriate piece of identifying information within each time window and such receipt within each time window to provide authorisation of the apparatus of the apparatus until the next window. If that information is not forthcoming, manifested by incorrect modulation information or insufficient received signal strength, because the paired user part not within range as defined by the spatial envelope, the apparatus part, through the control means 381 initiates a check for the absence of receipt of identifying information in a predetermined number of consecutive time windows to determine if it was a temporary loss or permanent. If such check confirms absence for said predetermined number of consecutive time windows, a cessation of communication link is declared to exist and delayed loss of vehicle function initiated.

The above embodiment has been described with respect to both uni-directional and the preferred bi-directional operation, but in both cases, the user part is of significant complexity insofar as it contains processing means and transmission means including control and modulation circuitry therefor.

Referring now to Figure 5 a third embodiment of communication means 323 is shown which effects a communication link between apparatus part 343 and user part 363 based upon bi-directional communication. the user part is in principle the same as 342 but, in keeping with the aim of achieving or an unobtrusive, readily carried form, empowered by radio frequency energy transmitted by the ATM, or indeed any other suitable electromagnetic energy, and comprises an analog or digital identity reference 'tag' recognised by a reader in the form of the ATM/ARM which transmits to it continually (as herein defined) and responds as appropriate to receipt or lack of receipt of a response.

Such a tag may take a simple analog form, as an inductive-capacitive (L-C) circuit tuned to a particular frequency of ATM transmission and which effects reflection or frequency doubling of the ATM transmission, or in a digital form in which a stored code is transmitted upon empowerment by reception of radio frequency energy from ATM. [Such digital tags are available from .*****..... see P650375]

It will be appreciated that for any apparatus part, it may be arranged to be paired with a plurality of different user parts and likewise for any user part to be paired with a plurality of different apparatus parts, and although it would be expected for the apparatus part to pair with a single user part to define a communication link by cycling through possible user parts to pair with upon initiation, the setting up of a communication link based upon intermittent transmission-reception windows makes it possible to accommodate several authorised user parts for one apparatus part simultaneously.

Each of the above described embodiments comprises establishment of a communication link between a user part and apparatus parts of a pair directly.

As discussed above, it is preferred that the user part has minimum dimensions and thus has minimal on-board power storage capacity and low transmission power, insofar as the apparatus part is in general associated with a vehicle (or other apparatus) which is large enough to permit the apparatus part to accommodate within it, or be connected to, a power source of significant storage capacity. It is preferred to design the apparatus part for maximum sensitivity to reception of signals from low power user part transmissions and to maximise the ATM power (if appropriate) to lessen any power burden on the user part.

To further facilitate achievement of such desiderata for the user part, referring now to Figure 6, thus shows in block a schematic form at 304 a fourth embodiment of authorisation system in accordance with the invention wherein the communication means 324 comprises, in addition to the user and apparatus parts 364 and 344, corresponding to parts 362 and 342 described above, a relay part 804 arranged to be disposed, in respect of the communication link, between the parts wherein at least the user part 364, and preferably also the apparatus part 344, is arranged to transfer identifying information by way of the relay part in preference to establishing a communication link directly.

As illustrated in the Figure, the relay part is arranged to be carried by the authorised user 12 in operation and may be less unobtrusive than the user part 364 and including a more powerful a battery power supply and transmission means and, if appropriate, receiver means, for communicating over a distance with respect to the apparatus part that is long relative to the distance to the user part, thereby permitting the user part to be made even smaller and carried more unobtrusively.

The relay part is under the physical control of the authorised user and may advantageously comprise additional functioning apparatus, such as a cellular phone device, which includes

many of the components required of the relay part, and from which the user also runs the risk of being separated, not only when forcibly separated from the vehicle by a hijacker but also when the apparatus is carried by the user remotely from the vehicle.

The communication link is thus effected by transmission from the user part to the relay part and from the relay part to the apparatus part, so that if, having established such link by virtue of the relay-carrying authorised user correctly initiating functioning of the apparatus, any cessation of the link caused by either or both of the user and relay parts being separated from the apparatus part or each other causes delayed inhibition of vehicle functioning.

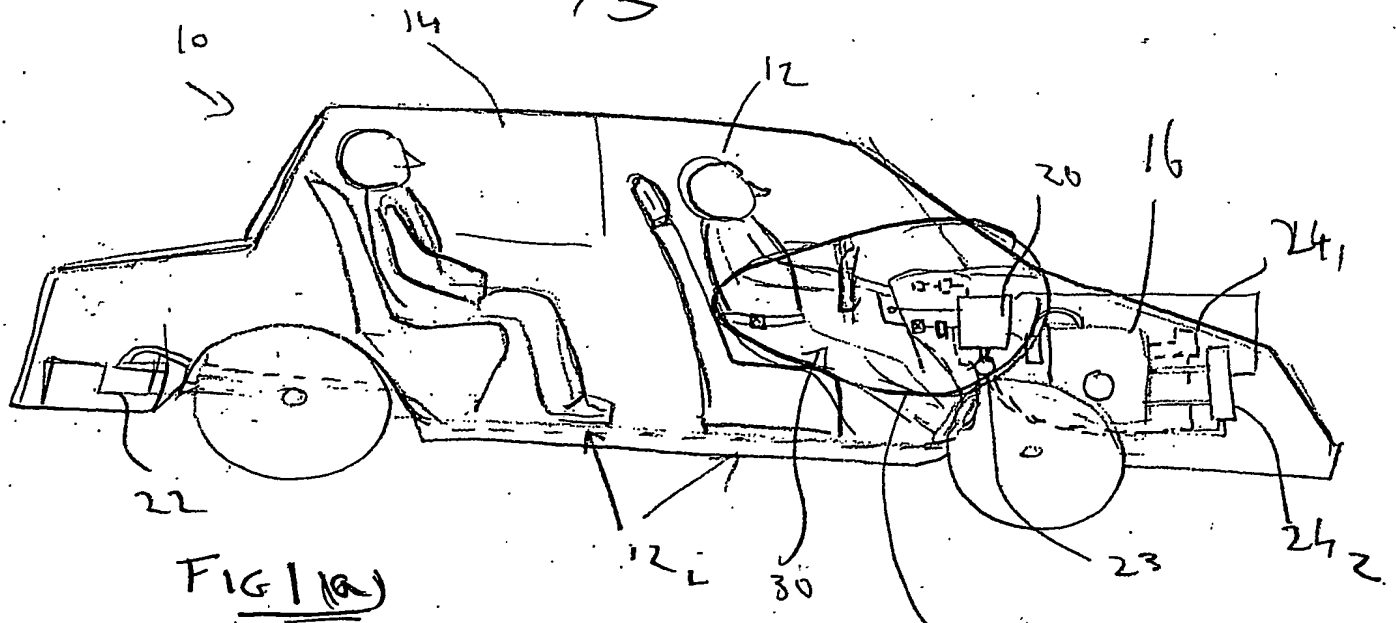
Although fundamentally it is only necessary for the relay part to be present in respect of transmissions from the user part to apparatus part, insofar as any link is bi-directional and carries identifying information unique to the transmission, it is preferred that the relay part encompasses full bi-directional communications with at least the user part, and many cellular phones are already enabled to communicate with local devices using the above-mentioned Bluetooth technology.

It will be appreciated that a functioning cellular phone or the like which is normally carried on the person of the authorised user when away from the vehicle, may be disposed in the vicinity of, rather than on the person of, the authorised user when the latter is within the vehicle but may nevertheless be employed as such relay part without affecting functionality of both cellular phone and vehicle.

It will be furthermore appreciated that additional functioning apparatus suitable for use as the relay part may comprise a so-called hand-held or lap-top computer, watch or entertainment device, any of which may be carried by, and at risk of being taken from, an authorised user.

Any such device is particularly suitable if, as mentioned above, it is enabled for wireless per-to-peer networking using the Bluetooth or like system. Such relay part may, of course, have no other function than to operate as a relay part.

It will also be appreciated that notwithstanding the above description of functional apparatus as being a vehicle and "additional" functioning apparatus as a relay part in forming a communication link therewith, such functioning and communicating apparatus as normally carried by the authorised user may constitute the functioning apparatus which is the authorisation system is for. Etc...



2/3

Fig 3(a)

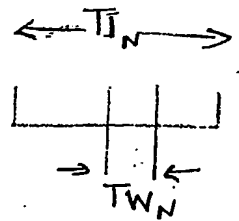
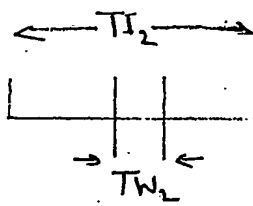
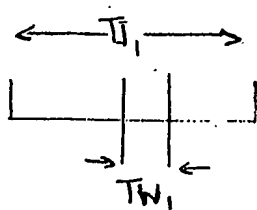


Fig 3(b)

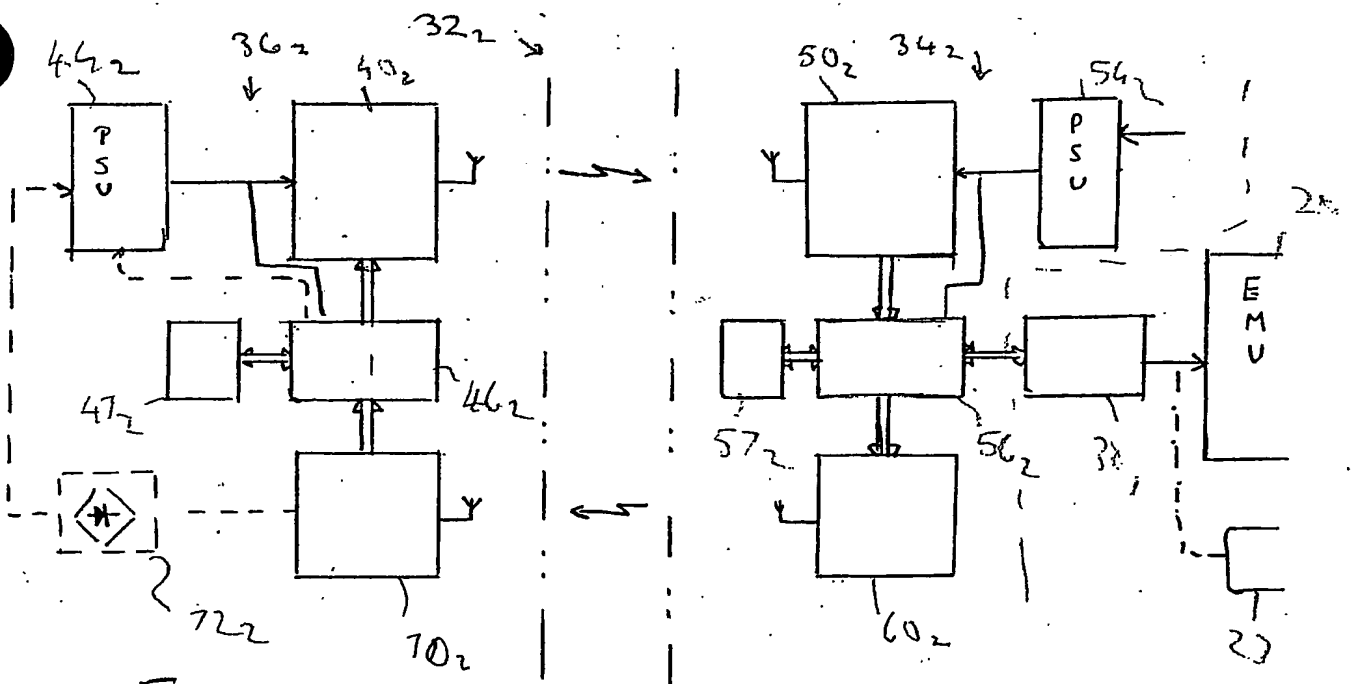
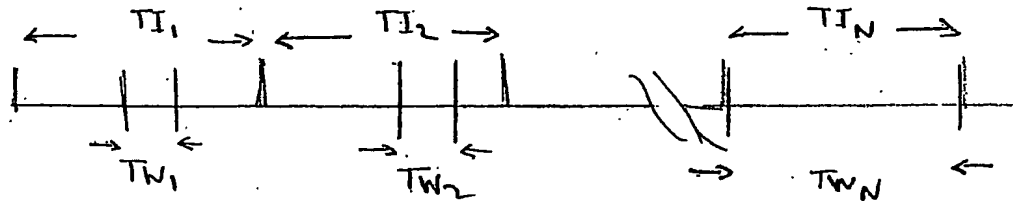


Fig 4

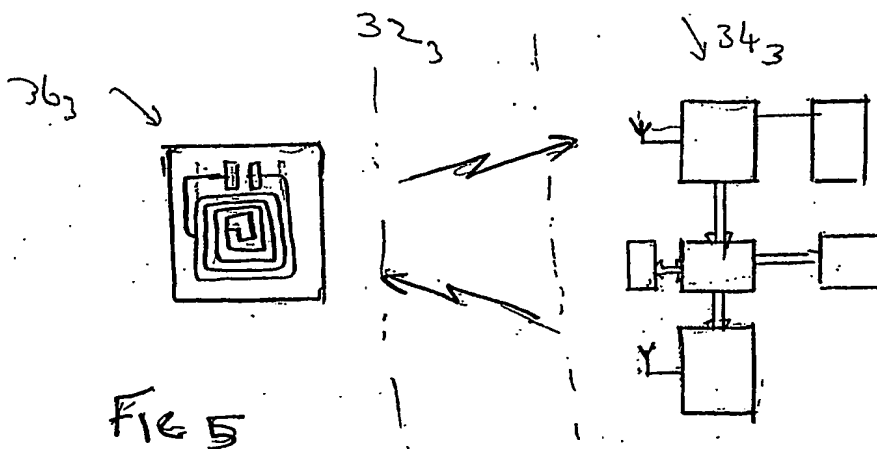


Fig 5

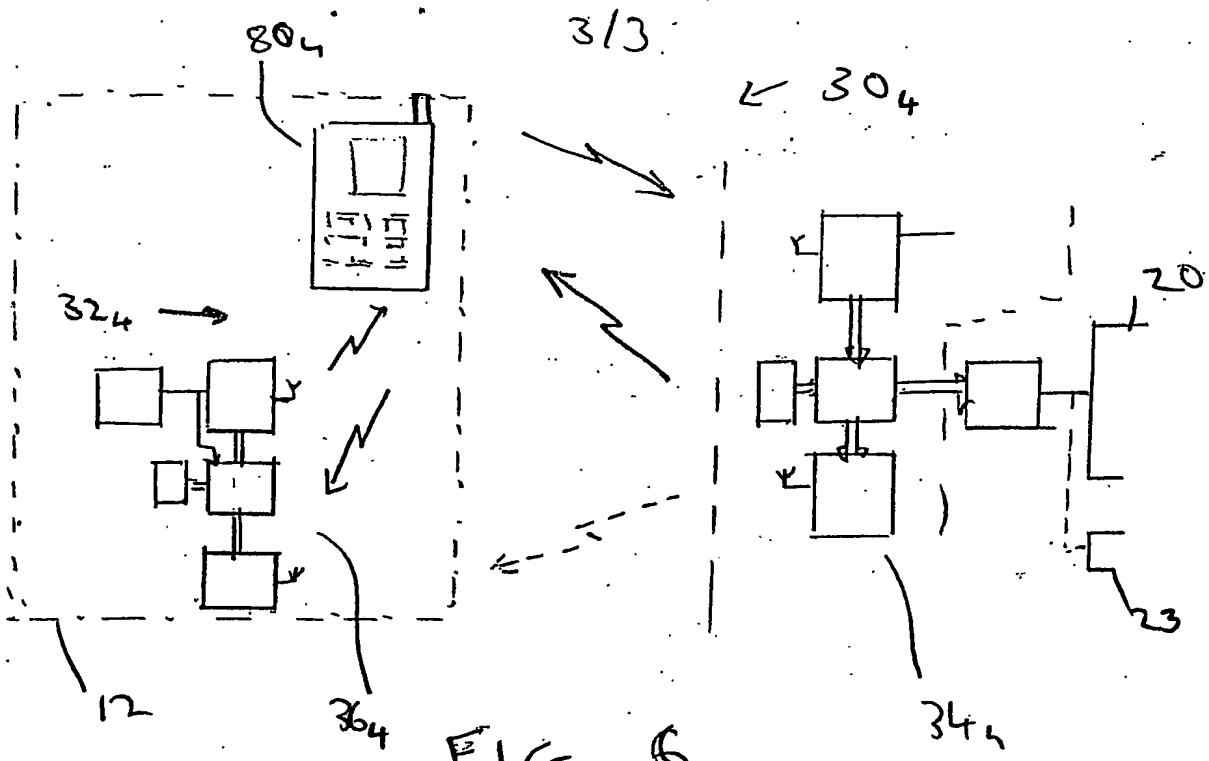


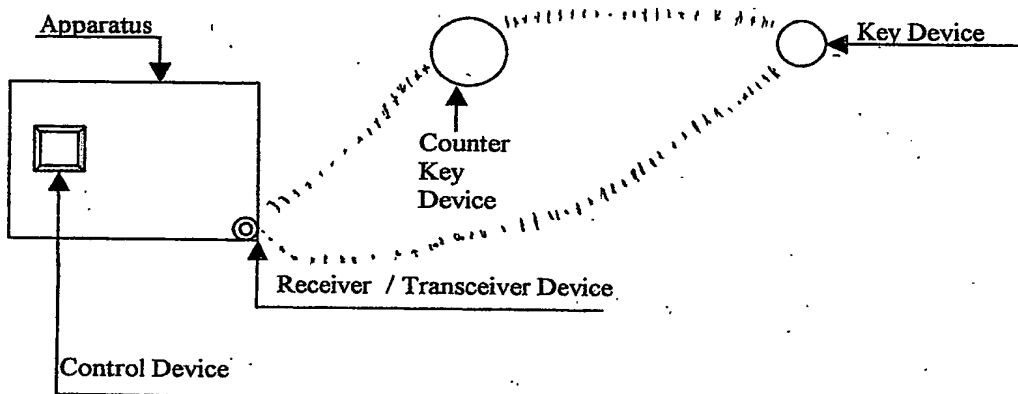
FIG. 6

Additional (Specification) Information

A counter key device (Fig. 8) may also be included to enhance the present inventions security aspects. The counter key device may also have a continuous communication link and communicate with the key device and control device. This communication link preferably operates on radio frequency signal or infra red frequency /peer-to-peer / Bluetooth.

The advantages of having a counter key device are to be found in the area of security or personal safety of the authorised user. For example the counter key device may restrict the use of apparatus i.e. govern speed of vehicle or limited use of apparatus. The counter key device may also be used for multi functional operational purposes of the apparatus. Other advantages include methods such as additional system power or memory capabilities etc.

The counter key device may also be programmed to signal a users "unique users identification code number" for the purposes of accessing apparatus and operating systems such as the internet, telecommunications systems and various other apparatus s operational systems and networks etc. The unique code incorporated in the counter key device may be relayed to a receiver device incorporated in to various apparatus software systems and networks etc.



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